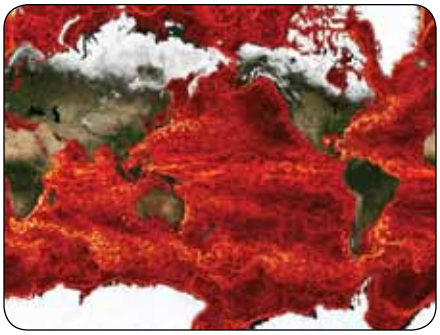
National Aeronautics and Space Administration

NASA's Strategic Capabilities Assets Program

NASA AMES RESEARCH CENTER
HIGH-END COMPUTING CAPABILITY



The NASA Advanced Supercomputing (NAS) facility at NASA Ames Research Center provides users with integrated supercomputing support services throughout the entire life cycle of their science and engineering projects. Our high-end computing (HEC) resources are integrated with mass data storage systems and high-speed networks and are augmented by customizable support in software performance optimization, advanced scientific visualization, and 24/7/365 user services.

PRODUCTION SUPERCOMPUTING: Our HEC experts manage all aspects of the NAS production-supercomputing environment to ensure users get secure, reliable resources. The current environment includes two supercomputers, two secure front-end systems requiring two-factor authentication, and two secure unattended proxy systems for remote operations. The Pleiades supercomputer was recently expanded to 84,992 cores and enables striking advances in addressing NASA's real-world science and engineering challenges. The Columbia supercomputer, scaled back to make room for this expansion, continues to be a reliable workhorse for many important science and engineering projects for the Agency.

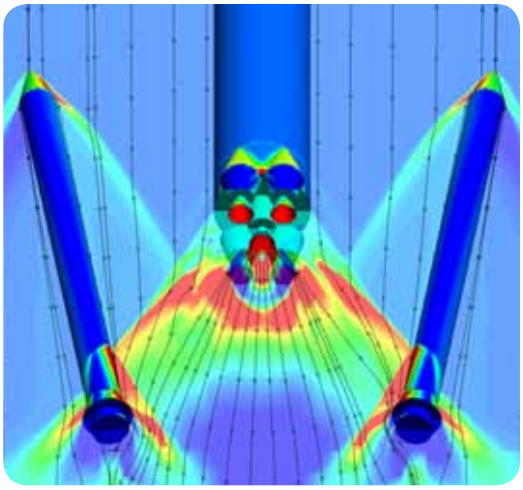
MASS DATA STORAGE: NASA's HEC customers often require vast amounts of data storage. With about 45 petabytes (PB) of tape storage and over 7 PB of disk storage on the floor, NAS's mass storage system allows users to archive and retrieve important results quickly, reliably, and securely. Storage specialists create custom file systems to temporarily store large amounts of data for priority user projects in addition to providing individual training to help users efficiently manage and move such massive volumes of data.

NETWORKING TECHNOLOGIES: High-speed networking technologies and services are essential to taking advantage of NAS's HEC systems and are of critical importance to our diverse customers. Using high-capacity network expertise and connections, scientists seamlessly transfer their massive datasets—some over 50 terabytes—between local and remote systems at speeds exceeding 5 gigabits per second. Our network engineers also customize transfer strategies and protocols to vastly reduce the time-to-solution for users.

PERFORMANCE OPTIMIZATION: NAS application optimization experts enhance the performance and scalability of NASA's complex codes so researchers can more effectively utilize the HEC systems, allowing them to do more science and engineering in less time. Services range from answering basic questions and porting codes to current architectures to partnering with users for in-depth code performance enhancement. We also evaluate tools and technologies best suited for the NAS environment and give feedback to outside tool developers.

SCIENTIFIC VISUALIZATION: We develop and apply tools and techniques customized for NASA science and engineering problems. These tools help users view and explore results from their desktops so that they can quickly pinpoint important details. Working closely with users, NAS visualization experts capture, parallelize, and render the enormous amounts of data needed to produce high-resolution, three-dimensional images and videos. Our 245-megapixel visualization system, the hyperwall-2, allows researchers to visualize massive datasets directly from the HEC systems.

USER SERVICES: Our user services team works 24/7/365 to ensure that users have secure, reliable access to our HEC systems. This team anticipates and prevents problems and quickly resolves challenges as they arise. During Space Shuttle missions, the team marshals HEC components and NAS staff to ensure the essential support is in place for vital analysis tasks. This protocol enables engineers to rapidly provide mission managers with the critical data needed to clear the Shuttle for landing. The user services staff monitors all systems, networks, job scheduling, and resource allocations to ensure a stable, seamless computing environment.



System Name	System Type	# of Cores	Peak	Total Memory
Pleiades	SGI Altix ICE ES8200EX	84,992	1.009 petaflops/s	133 TB
Columbia	SGI Altix 3700/3700BX2/4700	4,608	30 teraflops/s	9 TB
hyperwall-2	AMD Opteron Nvidia GeForce GTX 480	1,024 136	148 teraflops/s	2 TB

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